Announcements

- EXAMs will be returned at the END of class today!
- Homework for tomorrow…

  Ch. 29: CQ 4 & 5, Probs. 6, 12, & 44

- Office hours…

  MW 10-11 am
  TR 9-10 am
  F 12-1 pm

- Tutorial Learning Center (TLC) hours:

  MTWR 8-6 pm
  F 8-11 am, 2-5 pm
  Su 1-5 pm

Chapter 29

Potential & Field

(*Sources of Electric Potential* & *Finding the Electric Field from the Potential*)

Review…

- *Electric potential difference* from the *Electric field*…

$$\Delta V = -\int_i^f \vec{E} \cdot d\vec{s}$$

- *Graphically:*
  - ΔV = *negative* of the area under the *E* vs. *s* curve between s_i & s_f

- *Emf* of the battery is the *work done per charge*.

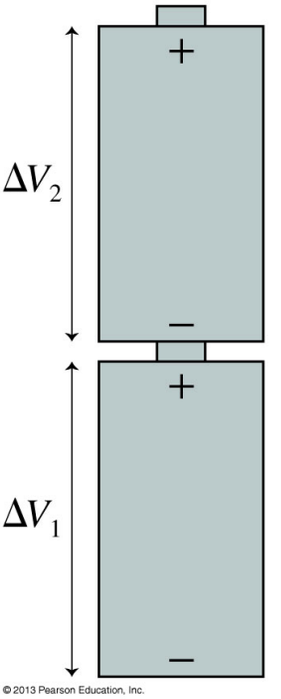
$$\Delta V_{bat} = \frac{W_{chem}}{q} = \mathcal{E}$$

Batteries and emf

Q: What is the *potential difference* of two batteries in series?

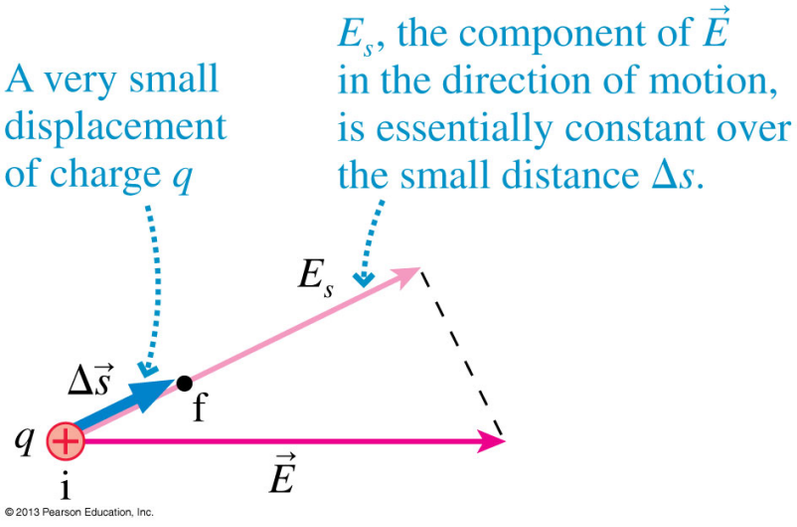
- A: The *sum* of their terminal voltages.

$$\Delta V_{series} = \Delta V_1 + \Delta V_2 + \ldots$$



29.3: Finding the *E*-field from the Potential

Calculate the *potential difference* between points *i* and *f*...

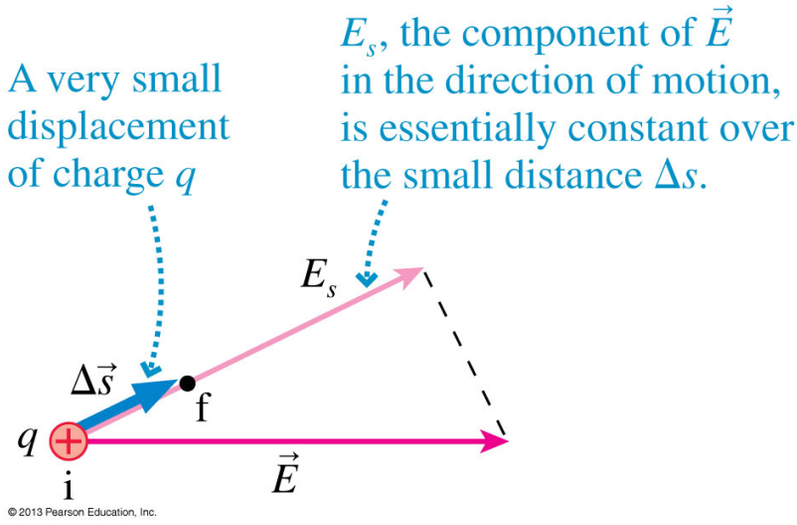


29.3: Finding the *E*-field from the Potential

Calculate the *potential difference* between points *i* and *f*...

$$E_s = -\frac{dV}{ds}$$

Component of *E*-field in the *s* direction!

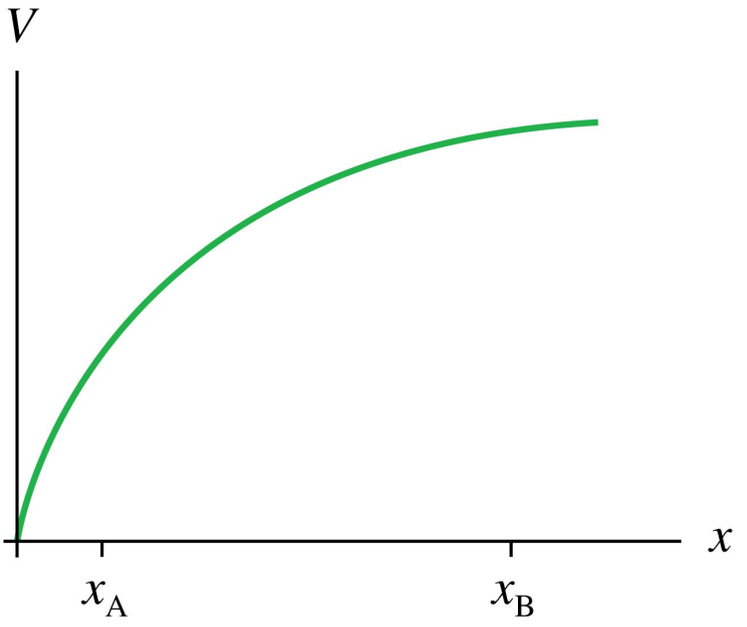


Finding the *E*-field from the Potential

i.e. Calculate the *E*-field of a point charge from the *electric potential*…

Quiz Question 1

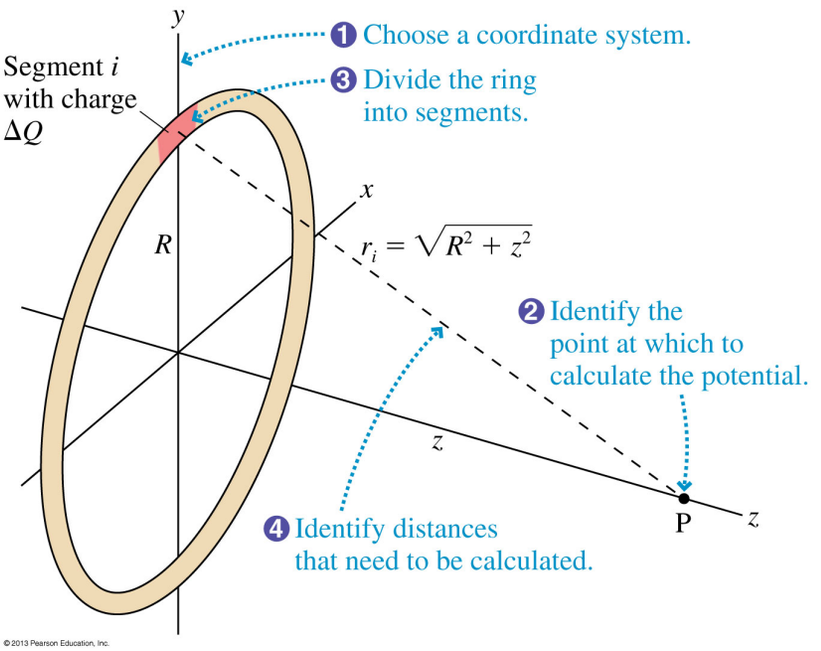
At which point is the *E*-field stronger?



1. At x_A.
2. At x_B.
3. The field is the same strength at both.
4. There's not enough information to tell.

i.e. 29.3
The *E*-field of a ring of charge

i.e. Calculate the *E*-field (on axis) of a ring of charge from the *electric potential*...

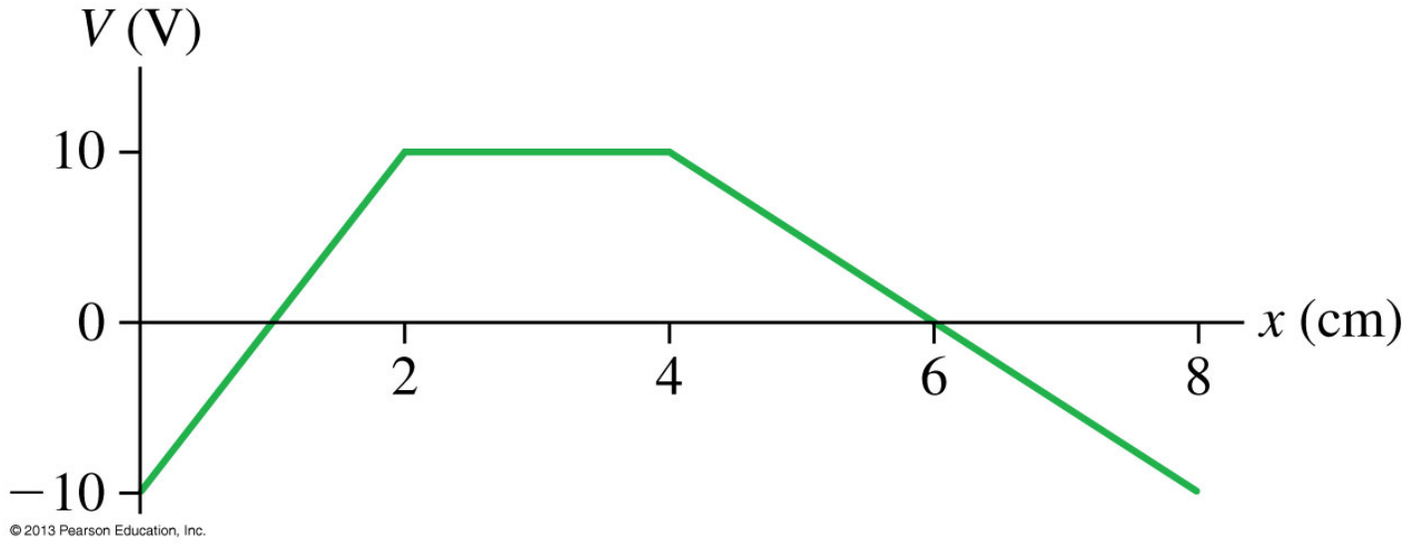


$$V_{ring} = \frac{KQ}{\sqrt{z^2 + R^2}}$$

i.e. 29.4
Finding E from the slope of V

The figure below is a graph of the electric potential in a region of space where E is parallel to the x-axis.

Draw a graph of E_x versus x.



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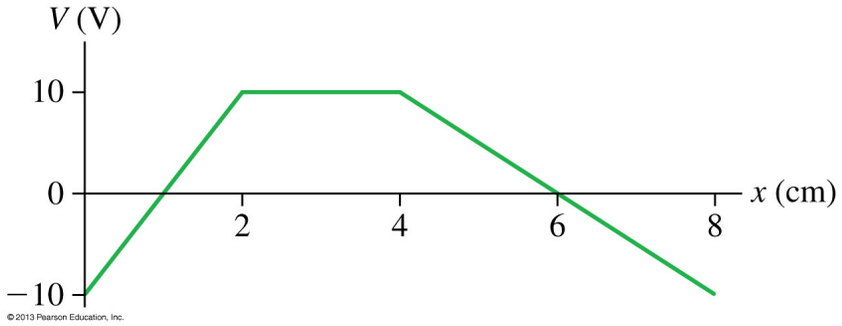
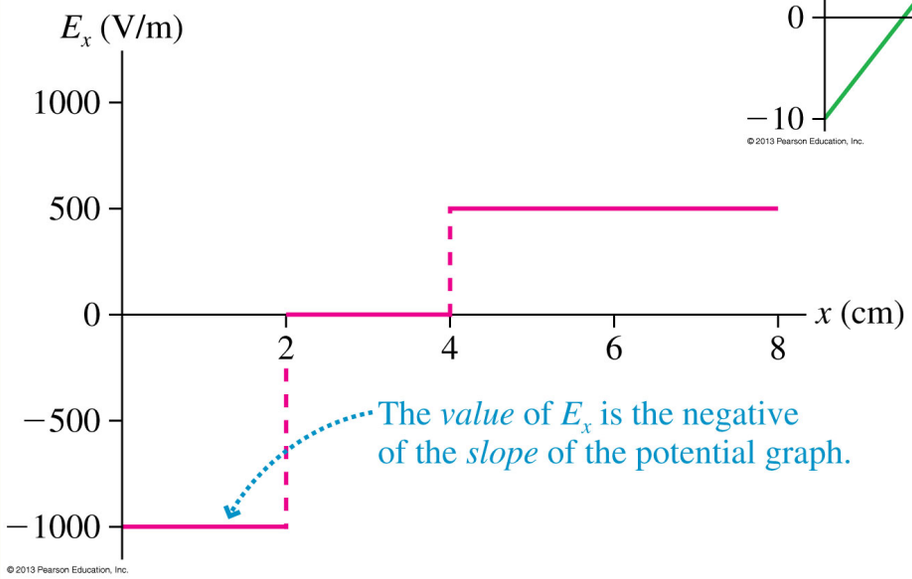
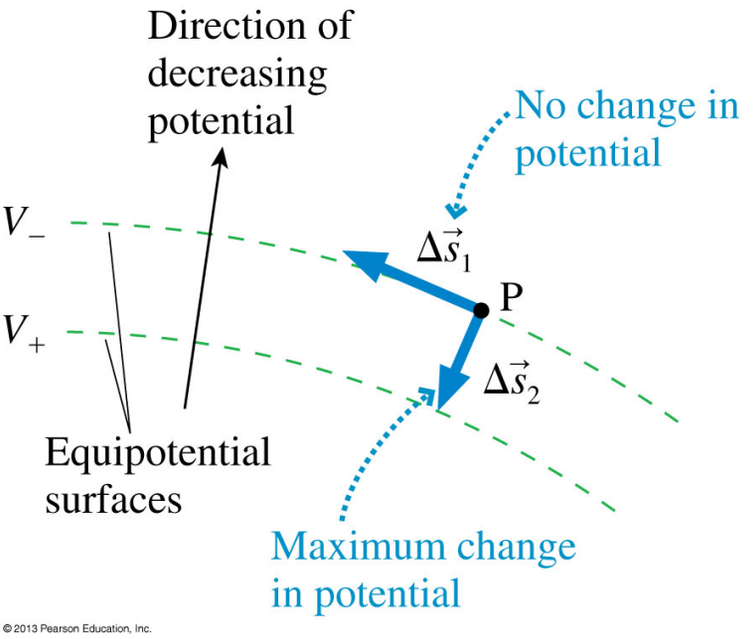




The Geometry of Potential and Field

Consider two *equipotential* surfaces, with V_+ positive relative to V_- ...

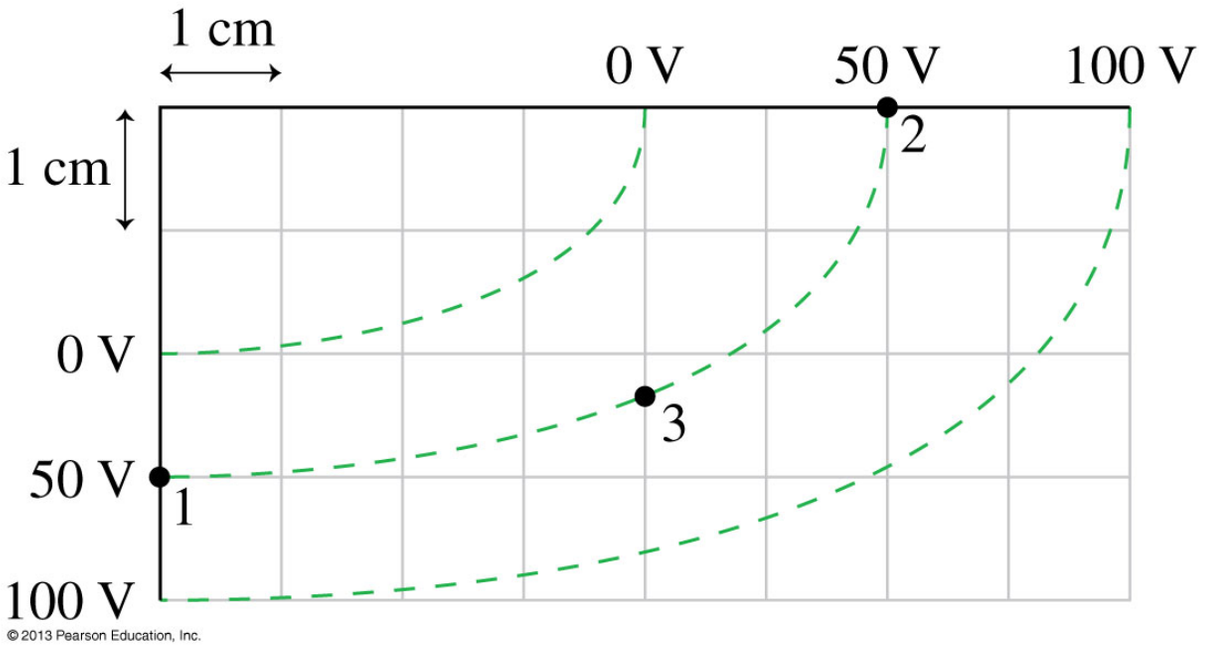


Notice:

- *E* is *perpendicular* to the *equipotential surfaces* and points "downhill" in direction of *decreasing potential*.

i.e. 29.5: Finding the *E*-field from the equipotential surfaces

Estimate the *strength* and *direction* of the *E*-field at pts. 1, 2, & 3.



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